such as his *isolation*, being "cut off time out of mind from the rest of the world," and the fact that "the remains of primeval art and the impress he made upon nature bespeak for man a residence in the New World coeval with the most distant events of history," the author, if we understand him aright, adopts the theory of the unity of the human race. If by unity is meant a common origin from one creative centre, and that a creation *de novo*, rather than derivative, then we dissent. Indeed, reasons are given in every chapter of the work, for believing that the Red race of America never had any intercourse, or bore any relationship to other peoples of any portion of the globe, unless we trace man back so far into time past that we see him the occupant of continents not now existing as such. A word, and we have done. On page 35, Dr. Brinton states that "not a tittle of evidence is on record to carry the age of man in America beyond the present geological epoch." In this connection we would call attention to the remark of the late Professor Wyman, on page 45 of Fresh-Water Shell-Mounds of Florida, as follows: "The ancient remains found in California . . . by Professor J. D. Whitney, and referred by him to the tertiary period," etc., etc. To this is added an important foot-note, that "the ample evidence collected by Professor Whitney, but not yet published, substantiates the opinion given above with regard to age." We have, therefore, something more than a tittle of such evidence, and we are carried back to a time when man in America was even too primitive to originate those curious myths which afterwards became so marked a feature of their lives, and which Dr. Brinton has most successfully interpreted.

RECENT BOOKS AND PAMPHLETS. — Prehistoric Man. Researches into the Origin of Civilization in the Old and New Worlds. By Daniel Wilson. Third edition, revised and enlarged, with illustrations. 2 vols. London: Macmillan & Co. 1876. 8vo, pp. 399, 401.

List of Skeletons and Crania in the Section of Comparative Anatomy of the United States Army Medical Museum, for Use during the International Exhibition of 1876, in Connection with the Representatives of the Medical Department, United States Army. Washington, D. C. 1876. 8vo, pp. 52.

An Account of the Worcester Lyceum and Natural History Association. By Nathaniel Paine. Prepared for the International Exhibition, 1876. Worcester. 1876. 8vo, pp. 13.

On some Characters of the Genus *Coryphodon* Owen. By Professor O. C. Marsh. 8vo, pp. 4. (From the American Journal of Science and Arts, vol. xi., May, 1876.)

GENERAL NOTES.

BOTANY.[1]

ARRESTED GROWTH AND PERSISTENCE OF BARBULA RURALIS. — During a visit made to Ile Royale, Michigan (Lake Superior), in the summer of 1874, my attention was called to a curious example of the

[1] Conducted by PROF. G. L. GOODALE.

preservation of such a fragile organism as a moss, while what we regard as more enduring objects perish and disappear. At Scovill's Point, a sharp, high tongue of rock, of trap formation, running out into the lake for several hundred feet, the almost level summit presents a large space thickly carpeted with the moss *Barbula ruralis* Hedw. In this were inscribed a number of names and dates, made by simply cutting away the moss and letting the underlying rock appear. The inscriptions, mostly in bold characters of several inches in length, were in general distinctly legible, the dark green (almost black) moss preserving the outlines, and appearing, with few exceptions, to have remained at a stand-still — neither decaying nor growing — since the writings were made.

One of the most prominent names was that of the gentleman after whom the point is called. This has the date '46 attached to it; and a friend, a mutual acquaintance, who accompanied me and pointed out the place, informed me that in the year denoted (twenty-eight years before), the gentleman, visiting Ile Royale, to his surprise, found inscriptions in the moss here, and added his name with the date. His son was with him at the time, and, revisiting the island in 1872, climbed up here to see whether any trace of his father's writing remained, and to his astonishment finding it as well as the other inscriptions undisturbed, cut his own name with the date — all in the Barbula. The isolated locality, and the steep (mostly perpendicular or overhanging) sides of the cliff, render it probable that few persons would find their way to the spot without some such object in view. The inscriptions, as seen by me in 1874, were as follows: "June — 1825." "— 43." "P. A. Scovill, '46." "— 1847. — " O. C. Scovill — 1872."

The first of these inscriptions I have thought may have been made by the party of Captain Bayfield, R. N., who about the date given made his survey of Lake Superior, undoubtedly visiting this island. That it and the other older ones should be preserved for such a length of time in so fragile a substance, is surely remarkable. From the time at which I saw them to the earliest date would cover a period of forty-nine years. And most interesting is the evidence here conveyed of the persistence of the moss, coupled with its arrested growth. The plants were so dry and brittle as to be easily rubbed to powder between the hands, and could with difficulty be removed without breaking them. Yet on placing some in water they revived so as to apparently present full vitality.

This is not the first time I have had my attention called to this plant and its semi-torpid habit. It must be of exceedingly slow growth; and I believe it is but rarely found in fruit. Though it is abundant on Lake Superior, I have never met a fertile specimen. — HENRY GILLMAN, Detroit, Michigan.

ON THE HYGROSCOPIC MECHANISM BY WHICH CERTAIN SEEDS ARE ENABLED TO BURY THEMSELVES IN THE GROUND. — Mr. Francis Darwin read an interesting paper on this subject at a recent meeting of

the Linnean Society of London. The plant on which his observations were made was chiefly the feather-grass, *Stipa pennata*, but the same phenomena exist in many grasses, in *Anemone montana*, and in some of the Geraniaceæ. The essential points of structure common to all these self-burying seeds are: (1) a sharp point more or less covered with reflexed hairs; (2) a strong woody awn sharply bent at one point so as to be divided into a lower vertical and an upper more or less horizontal part, the vertical part being strongly twisted on its own axis (or forming a helix as in the Geraniaceæ). The hygroscopic phenomena exhibited by all the seeds are, (1.) On being wetted the vertical part of the awn untwists, and causes the straight horizontal part to revolve and describe a circle in a horizontal plane; the angle between the vertical and horizontal parts also gradually disappears, and the awn becomes straight. (2.) As the awn becomes dry again, the movements just described are reversed, the angular bend and the torsion of the lower part of the awn appearing. The process by which the seed of *Stipa* buries itself is as follows: the long feathery horizontal part of the awn is easily entangled in low vegetation, and the seed is thus held in a more or less vertical position, its point resting on the ground. When the awn becomes wet it tends to untwist, but the horizontal part being unable to revolve, the rotation is transferred to the seed; the tendency of the seed to straighten itself is also converted into pressure of the point of the seed against the soil. As the awn dries again, the seed is not pulled out of the ground, as would be the natural result of the reversal of the movements by which it was buried. On the contrary, it is actually thrust deeper into the soil during the process of drying. By the combination of these two alternate actions the seed is completely buried. What special advantage it may be to a plant that its seeds should be buried is uncertain; in the case of *Stipa*, at least, it seems to have no connection with germination; it is conjectured that it may serve as a protection against graminivorous birds, etc. The explanations given by Hildebrand of the twist in the awn of the wild oat, and by Hanstein of the torsion of the awn of *Erodium*, appear to be inadequate to explain the phenomena. The hygroscopic torsion of the awn appears really to depend on the power of torsion residing in the individual cells of which the awn is composed. Thus when an isolated cell is dried it twists on its own axis in precisely the same manner and direction as the awn itself; and just as the latter untwists in moisture, so do the individual cells in like condition. It is demonstrable that the torsion of the separate cells must cause the awn to twist as a whole. This remarkable power appears to depend on the molecular structure (stratification and striation) of the walls of the twisting cells. Although it was previously known from the researches of Nägeli and others, that certain cells become twisted in drying, yet their combination so as to produce torsion in a considerable mass of tissue has not before been observed. Neither

has the power of torsion in drying, possessed by the cells, been hitherto shown to be of use in the economy of any plant. — A. W. Bennett.

The Potato Disease. — The supposed discovery of the sexual reproductive organs of *Peronospora infestans*, the fungus which causes the potato-blight, by Mr. W. G. Smith, continues to attract much attention in England and on the Continent of Europe. The eminent mycologist, Professor De Bary, of Strasburg, does not altogether accept Mr. Smith's conclusions, believing that what he considers the resting-spores of *Peronospora* must belong to some other fungus accidentally present in the decaying tissue; and his views were recently explained at the Linnean Society of London by Mr. Carruthers, F. R. S. Professor De Bary proposes to divide the group Peronosporeæ into three genera. In *Cystopus* the conidiophores grow in large bunches, the conidia being developed in single rows in basipetal order. In *Peronospora*, from a tree-like mycelium, conidiophores arise singly or in small bunches at the ends of the branches, and have no successors in the direct line. The new genus, *Phytophthora*, to which the old *Peronospora infestans* belongs, differs in its multiple and successive conidia, which, when shed, leave swellings on the branches. In all three genera the ripe conidia, when placed in water, produce ciliated zoöspores, which penetrate the tissue of the host and develop threads or mycelium. By another and sexual mode of propagation the oögonia, bladder-shaped female cells, after being fertilized by the small male cells or antheridia, produce from their protoplasm a thick-walled oöspore, from which mycelial threads sprout, and the process is then repeated. A considerable period of inactivity may, however, precede the germination of the oöspore, which in this case hibernates during the winter, while its host decays. The conidia propagate and spread the fungus during the summer season only, and do not live through the winter. Professor De Bary has found in decaying potato-tubers bodies exactly corresponding to oögonia. On experimenting with the oöspores of these and planting them in potato-plants he obtained minute bodies which conducted themselves precisely like zoöspores, and in most respects resembled those of *Pythium*. Other experiments with them, on the moistened legs of dead flies and bodies of mites, resulted in their complete phases of development which were watched step by step, the zoöspores producing a plentiful crop of mycelium, etc. As this new fungus differs in many ways from *Phytophthora infestans*, De Bary proposes to call it *Pythium vexans*, and he regards it as belonging to the Saprolegnieæ. The fungus named by Montagne *Artotrogus*, and the warty bodies found associated with it he believes to be two forms not connected genetically, and only imperfectly known. He has likewise investigated the question of the perennial mycelium of *Phytophthora* occasionally hibernating where the oöspores are not found in the district, and believes that he has proved that there are two methods by which the conidia may pass from the tuber to the foliage. — A. W. B.

APLECTRUM WITH CORAL-LIKE ROOT. — Early in April, 1876, in transplanting some *Aplectrum hyemale* Nutt., from the woods northwest of Detroit, I found two adjoining plants of this species having branched and toothed coral-like roots, similar to those of *Corallorhiza*, immediately beneath the usual bulb or corm, which was also provided with the ordinary rootlets. Each plant had the green leaf which the species sends up in autumn. A close examination of forty-three additional plants from the same woods failed to discover another instance of this interesting and significant peculiarity. I have transplanted from this place, at various seasons, during eleven years over one hundred specimens of this plant; but never before found a case like the above-described. The coral-like roots seemed parasitic on the partly decayed bark of a tree-root, and the whole was imbedded in ice, the frost still being in the ground. The absence of the coral-like root has been made a generic distinction separating *Aplectrum* from *Corallorhiza*.

I have sent the specimens to Professor Gray, who previously had never seen nor heard of this "unexpected fact." I request of botanists throughout the parts of the country where this plant is found, to search for the peculiarity, that we may learn whether it exists elsewhere, and to what extent; though, from my own experience, I think it likely to prove most exceptional. — HENRY GILLMAN, Detroit, Michigan.

RESEARCHES IN REGARD TO GROWTH. — The method pursued by Reinke appears to be a modification of that employed in the laboratory at Würzburg, and for which he does not give the credit due. The improvement in the apparatus seems to be a real one. A balanced and therefore tight thread goes from the growing plant over a wheel, which by index and multiplier enables the observer to watch and record the growth. A microscope of long focus is used to read the vernier. A notice of the results obtained by the use of this apparatus must be deferred.

RHYNCHOSPORA CAPILLACEA VAR. LEVISETA. — This is named and was discovered by the Rev. E. G. Hill, and is characterized by having the perianth bristles *perfectly smooth*, while in the ordinary form they are downwardly denticulate-roughened. Except in this remarkable particular the plant appears to be undistinguishable from *R. capillacea*. Mr. Hill found the plant in wet pine barrens, around the head of Lake Michigan, at Pine Station, Indiana. There is another variety, hardly needing a name (at least until it is confirmed by finding it constant, and in other stations), discovered in Herkimer County, New York, in 1864, by Professor J. A. Paine, which has twelve bristles (instead of the ordinary six), and the remarkable stipe to the akene is rather shorter than usual. — A. GRAY.

AN HERBARIUM FOR SALE. — An herbarium containing specimens illustrating six thousand species of plants is offered for sale. Full particulars can be obtained from President Chadbourne, of Williams College, Williamstown, Mass.

Botanical Papers in Recent Periodicals. — *Comptes rendus*, No. 9. Boussingault, On the Influence exerted by Vegetable Mold on the Nitrification of Nitrogenized Substances used as Manures. S. Cloëz, On Elæococca Oil, and its Modification by Light. Ed. Heckel, On the Movements of the Hairs and Glands of the Leaves of *Drosera rotundifolia*, and in the Leaves of *Pinguicula vulgaris*. No. 10. A. Barthélemy, On the Absorption by Plants of Bicarbonates in Natural Waters.

Flora, No. 5 and continued in No. 6. Dr. H. Müller, On Heliotropism. (The following conclusions are reached: (1.) In a growing organ of a plant only those zones which have not yet finished growing, exhibit curvatures dependent on light. (2.) The heliotropic curvature is produced by *all* the sensitive zones during extension. (3.) The parts which grow most rapidly are most sensitive to light. (4.) Even negative heliotropism (curvatures away from the light) as in roots is most marked when growth is most vigorous. (5.) Heliotropic curvatures do not cease at once when the light is removed. (6.) The rate of the curving is slow at first, then is accelerated, reaches a maximum, after which it diminishes. (7.) The curvature is not always at the same place; it recedes gradually towards the lower end of the growing stem. (8.) The smaller the angle which the incident rays of light make with the axis of the stem, the slighter will be the effect produced. (9.) Heliotropism continues until growth ceases or until light has been brought to act upon two sides of the plant, or until the curvature from light is overpowered by curvature from gravitation (geotropism). (10.) Heliotropic curvature, under similar circumstances, increased with intensity of light. (11.) Stems which have been previously kept in the dark are more sensitive to light coming from one side, than are those which have been previously illuminated on all sides. (12.) The concave side, which is the one most highly illuminated, grows less rapidly than the other. (13.) Negative curvatures are not accompanied by uniform growth throughout all zones but are characterized by growth only in the lower zone. (14.) Heliotropic curvatures are more rapid when geotropism is excluded. (15.) Geotropism counteracts heliotropism, to differing degrees in different plants. (16.) Certain parts or stems are sensitive to light, and others are highly geotropic. (17.) Some negatively heliotropic roots are hindered in growth when they are illuminated on all sides.) X. Landerer, of Athens, Botanical Notes from Greece. No. 7 and 8. Hugo de Vries, On Wood Repairing Wounds (continued). J. Sachs, On Reinke's Investigations respecting Growth. (Alleging that what Reinke has lately published in regard to a new instrument for measuring rate of growth suppresses the fact that the method used is substantially that employed by Sachs.) A. Geheeb (noticing mosses from near the Rhone).

Botanische Zeitung, No. 11. Ph. Van Tieghem, New Observations respecting the Development of the Fruit and the supposed Sexuality

of *Basidiomycetes* and *Ascomycetes.* (Noticing Brefeld's paper, and claiming that Brefeld has substantially *confirmed* the results of Van Tieghem's early researches.) Max Reess, A Correction (of an alleged error in Brefeld's memoir). Reinke, Investigations Respecting Growth. No. 12. Dodel-Port, Concerning the Swarm-spores of *Ulothrix zonata.* Reports of Societies: Amsterdam, Jonkman, On the Prothallium of *Marattiaceæ.* No. 13. Th. Irmisch, A Contribution to the Natural History of *Cactaceæ.* (Considering the seedlings of *Rhipsalis.*) No. 14. In Reports of Societies: Gottingen. Holle, On the Organs of Vegetation in *Marattiaceæ.* Holle, On a New Camera (using a double mirror).

ZOÖLOGY.

The European Woodcock shot in Virginia. — A few days ago I received from Dr. M. G. Ellzey, of Blacksburg, Va., the information that "a European woodcock was shot in Loudon County, in November, 1873," by his brother, with a number of the common species these gentlemen secured together. The alleged occurrence being one of much interest, I wrote, asking for further particulars, in order to secure the "internal" evidence necessary to place the matter beyond question. Dr. Ellzey appears to be perfectly competent in the case, from the particularity of the reply with which he has favored me. "The flight of the bird was slower, heavier, and nearer the ground than that of the familiar bird. When compared with twelve or fifteen of the latter, it appeared at least twice as large as the largest of them; the wing was longer, more pointed, and possessed but one falcate primary. The bird was found to weigh fourteen and one half ounces; it seems to me that this weight alone is sufficient to determine the species, the heaviest American woodcock ever weighed by me being only seven and one half ounces, while the average is about five and one half. Moreover, the character of the wing settles the matter beyond dispute. I was at the time aware of the peculiarities of the European bird as compared with ours in this respect, and made the comparison with such care as to preclude possibility of mistake. I had not at the time, nor have I since had, the smallest doubt of the correctness of my diagnosis. The bird was not preserved, as I wished, to be sent to a taxidermist for mounting, but was cooked and eaten with the rest."

We have several authentic records of the casual presence of *Scolopax rusticola* in America, besides some less explicit references to the same fact in the works of leading sporting writers; but so far as I now remember, there has hitherto been no recorded instance of the occurrence of the species south of New Jersey. — Elliott Coues.

Notable Change of Habit of the Bank Swallow. — In treating of this bird (*Cotyle riparia*, Birds of the Northwest, p. 87), I state, "It becomes an interesting question whether the bank swallow will ever abandon its burrows, and so far modify its fossorial nature as to